

**GAO**

Report to the Chairman, Subcommittee  
on Technology and National Security,  
Joint Economic Committee, U.S.  
Congress

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March 1990

# FOREIGN TECHNOLOGY

## U.S. Monitoring and Dissemination of the Results of Foreign Research



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United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

B-201919

March 21, 1990

The Honorable Jeff Bingaman  
Chairman, Subcommittee on Technology  
and National Security  
Joint Economic Committee  
Congress of the United States

Dear Senator Bingaman:

This report responds to your request that we provide information on the major federal Departments and independent agencies that monitor foreign technology. As you requested, it also addresses the coordination of monitoring activities, the potential for duplication or gaps in such activity, and the use and dissemination of the information these agencies collect. This report does not include intelligence gathering involving the capability of potential U.S. adversaries, in keeping with your request for an unclassified report.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time we will send copies to interested parties and make copies available to others upon request.

Please contact me at (202) 275-4812 if you or your staff have any questions concerning the report. Other major contributors to this report are listed in appendix II.

Sincerely,

Allan I. Mendelowitz, Director  
Trade, Energy, and Finance Issues

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# Executive Summary

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## Purpose

The Chairman of the Subcommittee on Technology and National Security, Joint Economic Committee, asked GAO to develop a compendium of federal programs and activities that monitor foreign dual-use technologies—items that have both commercial and military use. GAO agreed with the Chairman's office to provide information on the leading federal Departments and independent agencies that monitor foreign technology and summarize their monitoring efforts. GAO's specific objectives were to (1) assess the coordination of monitoring activities, (2) identify duplication or gaps in the technologies monitored, and (3) examine the use and dissemination of the information collected.

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## Background

Scientific research information is being generated throughout the world. The United States, Japan, and Europe invest billions of dollars in research and development. Because research is so important to U.S. competitiveness, the United States must be aware of foreign research activity.

Federal monitoring activities range from the collection of raw data to the development of highly detailed foreign capability analyses. The result of this monitoring activity is important for enhancing scientific research and policy formulation.

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## Results in Brief

GAO identified a total of six Departments and independent agencies that account for much of the current monitoring. Within these agencies, GAO identified 62 federal civilian and military agency offices and divisions that monitor foreign technology.

There is no central source identifying all monitoring activity, and coordination among monitoring agencies is limited. This creates the potential both for duplication of monitoring efforts and gaps in monitoring coverage.

Federal monitoring produces substantial information that would be beneficial to researchers, program managers, and policymakers in other federal agencies and in private industry. However, there are several factors that hamper dissemination of this information, including different hardware and software requirements to access databases, diverse foreign country copyright laws, and limited resources for translating documents into English. Several possibilities may be available for improving access to monitoring information, specifically, a computer concept called gateways, and a database of experts.

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## GAO's Analysis

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### Many Agencies Monitor Foreign Technology

GAO found that the Departments of Commerce, Defense, Energy, and State, the National Aeronautics and Space Administration, and the National Science Foundation account for much of the federal monitoring of foreign technology. Within these 6 agencies, GAO identified 62 federal civilian and military offices and divisions that monitor foreign technology. GAO's review did not include the Central Intelligence Agency because it declined to cooperate.

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### Coordination Is Limited

GAO could find no central list of agencies that monitor foreign technology and so it developed its own by contacting various agencies individually. GAO found that generally agencies monitor foreign technology developments to support their differing missions, which range from monitoring scientific research to assessing national competitiveness. GAO also found that coordination among monitoring agencies is limited and therefore may create the potential for agencies to collect similar information. Moreover, because there is no central source, it is not possible to assess whether federal agencies monitor all potentially significant technologies. This situation presents an opportunity for gaps to occur in monitoring coverage; thus the U.S. may miss important developments.

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### Obstacles to Accessing Information

GAO identified a number of sources for foreign technical information collected by the government. Some of the information collected was available in seven different databases and in a number of agencies' internal files. Although more of this information could be made available to other agencies and the public, access to it is limited by a number of obstacles, including differing computer requirements and commingled restricted and unrestricted information. Improved access could enhance the dissemination of foreign technology information that the government develops.

Efforts have been made to improve access to this information in the past and several are underway now. A 1960s effort to coordinate agency scientific and technical information services ceased because of lack of support in the early 1970s. Although modest in scope and limited in resources, several efforts are underway today to improve access.

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Technological advances in accessing and retrieving computerized information may allow improved retrieval of foreign technical information now available in different agencies. These new approaches, with which some agencies are currently experimenting, are called gateways. They are attempts to electronically connect information systems that have different database structures, hardware, and software. To access information that is currently kept in informal files, it may also be possible to develop databases containing information on subject area experts. These databases may include their names, fields of expertise, and addresses.

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## Recommendations

GAO is making no recommendations at this time pending the results of ongoing efforts and research to improve access to the information the government collects.

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## Agency Comments

As agreed with the Chairman's office, GAO did not obtain written agency comments on this report, but throughout the review discussed these issues with agency officials and have incorporated their comments where appropriate.

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**Abbreviations**

ASSETS	Assessment System for European Technology and Science
COSATI	Committee on Science and Technical Information
DOD	Department of Defense
DTIC	Defense Technical Information Center
GAO	General Accounting Office
ITA	International Trade Administration
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
NTIS	National Technical Information Service
OJTL	Office of Japanese Technical Literature
OSTP	Office of Science and Technology Policy
STRIDE	Scientific and Technical Reporting Information Dissemination Enhancement

# Introduction

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Scientific research contributes to a healthy economy, a strong industrial base, and the general welfare of U.S. citizens. The federal government and private industry sponsor and conduct research programs to accomplish these objectives. They also collect scientific and technical information developed by other nations. Access to foreign scientific and technical information can help advance basic research, improve policy formulation, and contribute to the competitiveness of American industry.

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## The Widespread Generation of Scientific Information

Scientific research information is being generated throughout the world. The United States, European nations, and Japan invest billions of dollars in scientific research annually. In 1986, total U.S. expenditures reached more than \$98 billion in constant 1982 dollars. Japan and the major industrialized European countries have also made strong commitments to research. In 1986, the combined expenditures of Japan, France, West Germany, and the United Kingdom equaled over \$82 billion in constant 1982 dollars.

Because scientific research is so important to U.S. competitiveness, the United States must be aware of foreign scientific and technical research activity. In 1986, the last year for which data are available, about 64 percent of scientific and technical articles were written by authors outside the United States. Access to this information allows government and industry to avoid unnecessary duplication, benefit from existing knowledge, and accurately assess other countries' technical capabilities.

Scientific progress is often incremental—one bit of research building upon another. For this reason, scientific research advances more rapidly when data are shared internationally. Open communication allows foreign research to be assessed, reanalyzed, replicated, and incorporated into ongoing research and production. Without access to foreign scientific and technical information, U.S. scientists, industrialists, and policymakers could find themselves at a competitive disadvantage.

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## Three Levels of Monitoring Activity

Individual U.S. government agencies monitor foreign scientific and technical information differently, reflecting their missions and responsibilities. Some efforts are limited to the collection and dissemination of basic research data, while others involve the development of detailed foreign capability analyses.

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## Collection

At the primary level, government monitoring involves collecting and disseminating data, drawings, and research findings. U.S. agencies obtain this information through formal and informal methods.

The National Technical Information Service (NTIS) and the Defense Technical Information Center (DTIC) are two agencies that collect foreign research data, acquiring technical reports through formal international exchange agreements and cooperative relationships with other organizations. The NTIS collection includes about 2 million reports. Approximately one-third of the reports that have been added in the past 5 years include foreign technical information. DTIC's technical report collection includes approximately 1.5 million publications, between 7 to 10 percent of which represent foreign technical information. Other federal agencies also collect foreign scientific and technical information by monitoring scientific journals and databases and supporting joint research efforts.

In addition to these formal collection efforts, individual researchers collect information through informal exchanges with foreign scientists. This type of information may be recorded in travel reports and internal agency records. In other cases it may not be captured at all.

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## Collation

At a secondary level, some agencies index and abstract foreign technical publications, facilitating access to the information. Electronic files allow scientists and others to combine material on a single topic from various sources and nations. Agencies also publish newsletters covering recent scientific developments. The bibliographies and newsletters that these agencies produce inform scientists and others of technical activities in their fields and geographic areas of interest.

Several federal agencies have constructed computer files for collation and synthesis. NTIS produces a computerized database that indexes and abstracts reports, journal articles, and conference proceedings included in the NTIS collection. DTIC maintains its own Technical Report Database that allows the production of bibliographies based on the needs of DTIC users. The DTIC's Information Analysis Centers' computerized files contain current international research information and synthesize this information in selected subject areas.

Individual agency offices and units have also undertaken projects to meet particular needs. For example, the U.S. Navy's Office of Naval Research European Office maintains a database that provides access to reports, articles, and contact points relevant to European science and

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technology. Similarly, the Air Force's Foreign Technology Division has developed a database to report the use or appearance of certain technologies in the Eastern Bloc countries.

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## Analysis

At the highest level of information processing, U.S. agencies analyze foreign scientific and technical information. Specialists review data from many sources to answer questions of scientific or strategic interest. These efforts produce reports and briefing materials used to assess the scientific resources and capabilities of foreign nations. For example, the Defense Intelligence Agency has developed an automated system that measures levels of foreign scientific knowledge and compares these to current levels of U.S. technical accomplishment.

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## Objectives, Scope, and Methodology

In an April 10, 1989, letter, the Chairman of the Subcommittee on Technology and National Security, Joint Economic Committee, asked us to develop a compendium of federal programs and activities that track, or monitor, foreign dual-use technology, i.e., items that have both commercial and military use. We initially provided the Chairman with an interim report that listed a number of federal agencies monitoring foreign dual-use technology (Foreign Technologies: Federal Agencies' Efforts to Track Developments, GAO/NSIAD-89-192, June 1989). Subsequently, we agreed with the Chairman's office to limit the final compendium to the leading federal departments and independent agencies that monitor foreign technology and summarize their monitoring activities. We further agreed to focus our efforts on the coordination of monitoring activities, the identification of duplication or gaps in the technologies monitored, and the use and dissemination of information collected. (Because scientific research is a key element of technological development, we refer to scientific and technological research interchangeably.)

To identify federal programs and activities that monitor foreign technology, we contacted officials of agencies that we knew from prior audit work were the leading agencies in monitoring foreign technology. These officials identified other monitoring agencies. Based on our prior work, we focused our efforts on the Departments of Commerce, Defense, Energy, and State, the National Aeronautics and Space Administration (NASA), and the National Science Foundation (NSF).

We contacted each of these agencies and requested that they complete a data collection form on their agency units that monitor foreign technology. For each agency unit we sought information on the technologies

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they monitor, the countries they follow in that monitoring, how they use that information, the resources they devote to monitoring, and the availability of the information they collect to others outside their agency. This information is summarized in the body of the report and provided in greater detail in appendix I. We did not attempt to assess the quality of the information these agencies gather through their monitoring activities.

We asked officials of the 62 monitoring offices we identified in developing the compendium to respond to questions on their coordination activities. We then reviewed and summarized the responses. We also discussed coordination with an official of the Office of Management and Budget and a contractor working on technology monitoring under contract to the Defense Advanced Research Project Agency. Because we could find no listing of all federal monitoring activities, we were not able to assess whether there are any technologies that are not being monitored by the government. We were able to analyze the information on what technologies are monitored to ascertain how extensively different agencies review the same technologies. However, because different agencies use the information they collect for different purposes, we could not draw any conclusions about whether multiple agency monitoring of the same technologies constituted unnecessary duplication.

From officials of each monitoring agency we gathered information on the uses of the data they collected and the data's availability outside their unit. We held extensive discussions with a number of officials in the monitoring units within the six agencies and in the White House's Office of Science and Technology Policy about the accessibility of the information the government collects. Based on these discussions and a review of past and current efforts to improve such accessibility, we were able to develop information on obstacles to accessing information and federal efforts to improve access.

We did not include intelligence gathering involving the capability of potential U.S. adversaries, in keeping with the Chairman's request for an unclassified report. As a separate matter, we attempted to include the Central Intelligence Agency, but it declined to cooperate in this review.

We conducted our work between May 1989 and January 1990 in accordance with generally accepted government auditing standards. As agreed with the Chairman's office, we did not obtain written agency comments,

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**Chapter 1**  
**Introduction**

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but throughout the review discussed these issues with agency officials and have incorporated their comments where appropriate.

# Federal Civilian and Military Agency Efforts to Monitor Foreign Science and Technology

Sixty-two federal military and civilian agency units, responding to our questionnaire, indicated that they monitor information on foreign technology. Some have specific statutory authority for such monitoring. Others, while not specifically directed to monitor foreign technology, do so as part of a broader agency mission. Many U.S. agencies—most notably the Departments of Defense, Commerce, and Energy—monitor foreign technology to enhance U.S. competitiveness and to formulate trade and defense policy. Despite this extensive monitoring, we could find no central source identifying all such activity. Our review also indicated that coordination was limited. This creates the potential both for duplication of effort and for gaps in coverage.

## Federal Agencies Monitor Foreign Technology for a Variety of Reasons

Agencies monitor foreign scientific and technical developments for a variety of reasons. These include responding to a specific legislative mandate, meeting a program objective, and collecting information incidental to their primary mission.

Legislatively mandated monitoring activities include both civilian and defense programs. For example, the Department of Commerce's Japanese Technical Literature Program is required by the Japanese Technical Literature Act of 1986 (P.L. 99-382). The program was created to acquire, translate, and disseminate Japanese technical literature. The Export Administration Act of 1979, as amended, assigned to the Department of Defense the responsibility for defining critical technologies and requires that Defense give special emphasis to products that include technologies not possessed by countries that are the target of U.S. export controls. This in turn requires knowledge of the technological capabilities of such countries.

Other monitoring activities are the result of program objectives. For example, NTIS has a foreign technology program whose objective is to acquire technical information produced as a result of foreign government-sponsored research and to disseminate it to the U.S. research and development community.

Finally, some agencies monitor foreign scientific and technological developments incidental to their agency's principal mission. For example, the primary mission of Commerce's National Institute of Standards and Technology is measurement and standards in the United States, but the Institute's technical staff keep abreast of foreign developments in their disciplines.

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## Six Federal Agencies Do Much of the Monitoring

During our review we found that six federal departments or agencies, excluding the Central Intelligence Agency, accounted for most of the foreign technology monitoring. These agencies are the Departments of Commerce, Defense, Energy, and State, NASA, and NSF. Appendix I contains specific information on the activities of each of these entities.

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### The Department of Commerce

Commerce has several agencies that monitor foreign technology developments. These include NTIS, the Bureau of Export Administration, and the International Trade Administration (ITA).

NTIS collects foreign technical information and makes it available to the general public, private industry, researchers, and other federal agencies. The information is used to support research, industry planning, domestic policy formulation, and the foreign technology monitoring efforts of other federal agencies.

The Bureau of Export Administration monitors foreign technology to identify U.S. export controls rendered ineffective by the availability of foreign comparable commodities and to ensure the competitiveness of U.S. high technology firms in world markets. Monitoring is global, and the reports and studies prepared are generally available to other federal agencies on a need-to-know basis.

ITA units globally monitor specific foreign technologies, such as microelectronics, telecommunications, and industrial machinery. Information is used for such purposes as trade policy development and competitive assessments.

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### The Department of Defense (DOD)

DOD has many components that monitor foreign technology, including the Defense Logistics Agency's Defense Technical Information Center and the Defense Intelligence Agency. Other monitoring takes place at the three services (the Army, Navy, and Air Force).

DTIC serves as the central collection and distribution point for scientific and technical information produced under the DOD's research and development effort. DTIC collects and disseminates foreign technology information through international exchange agreements. DTIC also administers information analysis centers that acquire, analyze, and summarize foreign technology data in specialized subject areas.

The Defense Intelligence Agency monitors foreign technology developments. This information contributes to improving military industrial competitiveness and to providing planning information to other government agencies and private industry. Monitoring is global and focuses on specific foreign technology of strategic interest to DOD.

At the service level, the Army's European Research Office monitors foreign technology to identify and transfer technologies to appropriate Army research labs. The Navy's Office of Naval Research monitors foreign technology on a global basis, as does the Air Force's Foreign Technology Division.

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**The Department of Energy**

Scientists and technicians at research laboratories of the Department of Energy monitor foreign scientific and technical information in energy-related areas. They monitor countries with significant technical abilities in nuclear weapons, high-energy lasers, composite materials, supercomputer technology, and nuclear reactor technology. Information is used to support strategic planning for national security.

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**The Department of State**

Science officers at embassies throughout the world monitor technology developments. The information is sent to government agencies for their use in monitoring foreign scientific and technical developments.

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**The National Aeronautics and Space Administration**

NASA monitors foreign technology on a global basis and maintains a comprehensive information system covering aeronautics and supporting disciplines.

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**The National Science Foundation**

NSF monitors foreign technology to disseminate information on international science and technology. NSF maintains an office in Japan where it acquires and analyzes Japanese science and technology policy information and promotes international scientific cooperation.

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**Coordination of Monitoring Efforts Is Limited**

In our June 1989 report on federal monitoring of foreign technologies (Foreign Technologies: Federal Agencies' Efforts to Track Developments, GAO/NSIAD-89-192), we reported that we could find no central source that identifies all federal monitoring activities. In our subsequent work, including review of databases, numerous discussions with agency officials, and contacts with 62 units within 6 major agencies, we have

continued to find no such central source and have concluded that none exists.

We further stated in our earlier report that there was an apparent lack of formal coordination among agencies that monitor foreign technology. We subsequently contacted the 62 offices, bureaus, and divisions we had previously identified as monitoring foreign technology in the 6 major monitoring agencies. Our aim was to inquire about their coordination efforts. Of the 21 out of 62 responding to this query, 7 said that they did not coordinate their efforts with others; 9 said that they coordinated with at least 1 other agency; and 5 did not address coordination. For example, Army, Air Force, and Navy researchers shared information and technology tracking duties regarding Japanese technologies. However, a DTIC official in a draft agency report indicated that although many DOD organizations produce, collect, store, or distribute foreign science and technology information and certain agencies start programs to enhance the use of such information, no central DOD entity coordinates foreign technology monitoring. According to this official, DOD should establish a focal point for coordinating foreign science and technology monitoring programs.

While coordination is limited, there may be only limited resulting duplication of monitoring effort. We found that while numerous agencies monitor foreign technology developments, they do so within a limited subject range determined by their individual needs; therefore, subjects may be so specific as to exclude duplication. Nevertheless, the absence of a central government source identifying all monitoring efforts and the limited coordination among monitoring agencies create the potential for duplication of efforts to take place.

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### **Gaps in Technology Coverage May Exist but Are Difficult to Identify**

Because there is no central source that identifies all federal monitoring activities and because technologies contain a myriad of components (such as the dozens of steps involved in computer chip manufacturing, each of which embodies its own set of technologies), it is difficult to assess whether federal agencies monitor all potentially significant technologies. Current federal monitoring also suffers from limited coordination among agencies. This creates the potential for information gaps between agencies.

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# Improved Access to the Information That Federal Agencies Collect Is Needed

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The foreign scientific and technical information that the government now collects could be better used if access to it was improved. However, certain obstacles now hamper access. These include different computer requirements for accessing agency databases, commingled classified and unclassified information, as well as public and proprietary information, and limited language translation capability.

Previous efforts have been made to improve access, and new ones are underway; the present efforts, however, are limited in scope. Technological improvements now exist that may improve the ability to access existing information. Several knowledgeable sources believe the time may be appropriate to consider reestablishing an information point that is centrally accessible.

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## Sources of Foreign Technology Information Available

We identified two different data systems for maintaining information that the agencies we contacted generate. One is automated databases. The other is written agency and individual (personal) files.

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### Automated Databases

Several agencies maintain computerized databases that index and abstract reports and other information. These files are information summaries, organized and structured so that a variety of users' needs can be met. We were able to identify seven such automated database efforts. Table 3.1 contains a description of each.

**Chapter 3**  
**Improved Access to the Information That**  
**Federal Agencies Collect Is Needed**

**Table 3.1: Databases of Information on Foreign Technology**

<b>Agency and database</b>	<b>Type of information</b>	<b>Accessibility by outside agency</b>
Defense Intelligence Agency, Project SOCRATES	Assessments of selected foreign technological capability	DOD only
Department of Energy's Energy Database	Foreign abstracts and indexes of energy related technologies	Available to the public through commercial vendors
DTIC, Defense Research, Development, Test, and Evaluation Online System Database Network	Four major databases with summary descriptions or references to planned, ongoing, completed, and independent research and development	Classified DOD reports are available only through DTIC
NASA, Scientific Technical Information Database	Comprehensive scientific, engineering, and technical information with bibliographic coverage of world aerospace literature	Available directly from NASA and through commercial vendors
NSF, International Science and Technology Database	Data by industry classification (e.g., drugs, electrical machinery) for U.S. patents, trade, by country	Data directly available to the public. There is no other database similar in content and time series.
NSF, United States-Japan Cooperative Science Program Database	Scientific journals, books, and proceedings of professional societies addressing a variety of technologies	Available to the public through NTIS
NTIS, Bibliographic Database	Research results, studies, directories, handbooks, conference presentations, and proceedings covering a wide range of topics in natural and behavioral sciences	Available to the public through commercial vendors

**Agency and Individual Files**

Considerable information on foreign scientific and technological developments are contained in agency files. These include formal files that contain reports assessing foreign technology as well as informal files maintained by researchers and analysts. We identified a number of both formal and informal agency files, some of which are listed in table 3.2.

**Chapter 3**  
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**Table 3.2: Selected Agencies With Files of Foreign Scientific and Technical Information**

<b>Agency</b>	<b>Type of information</b>	<b>Accessibility by outside agency</b>
Department of State, Science Officers	Any data on scientific and technological developments	Available to interested federal agencies; information available to the public (some through NTIS)
Department of Commerce, Bureau of Export Administration	Assessments of foreign technological capability	Majority of information is classified and not available to the public
Department of Commerce, International Trade Administration	Capability and developments in various technical areas, such as electronics	Most materials available to the public. Some of these materials for security reasons are restricted.
Department of Commerce, National Institute of Standards and Technology	Journal publications and data developed through joint scientific exchanges covering a variety of technical topics	Available to interested parties
DOD, Air Force Systems Command's Foreign Technology Division	Aerospace scientific and technical intelligence	Available to DOD and DOD contractors with public access limited
DOD, Army Foreign Science and Technology Center	Developments in military material and hardware	Available to the intelligence community; some documents are later released by DTIC
DOD-various service laboratories	Developments in technology relevant to each individual lab's specialty	Availability varies with the information and laboratory involved
Department of Energy Laboratories	Developments in technology relevant to energy issues	Most of this material is classified. Limited to internal Energy units and some to other selected agencies
NSF, Japanese Technical Evaluation Center	Technical assessments of emerging Japanese trends in selected high technology areas	Published reports available to the public

The material these files contain is tailored to a specific audience, such as agency program managers. Some of this information is available to the public, while other information is only available to selected federal agencies or through individual contacts.

Regarding informal files, we found at least some government scientists, researchers, and analysts keep data in personal files, usually organized and structured to meet their individual needs. This information includes clippings, notes, reports, and articles relevant to their field of study that is accumulated from numerous sources. For example, researchers may rely on collegial relationships and professional contacts to learn about what is being done in other countries. They visit foreign researchers and record their observations in trip reports. They attend formal scientific meetings and exchange ideas informally, recording this information in

personal notes. They also collect information contained in foreign journals and magazines and unpublished research reports. We could not determine the amount or importance of data stored in personal files.

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## Obstacles to Accessing Available Information

Key officials in five of the six agencies we visited stated that they believed foreign technological information available in federal agencies would help scientists, researchers, program managers, and policymakers in other federal agencies and individuals in academia and private industry. However, there are several obstacles to accessing this information. These obstacles include differing computer requirements for accessing the different databases, the inclusion of classified and unclassified information in the same database, and limited translation capability.

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## Differing Computer Requirements

A key obstacle to accessing foreign science and technical databases such as those listed in table 3.1 is their differing computer requirements. Each database was produced for a different purpose, and the agencies use a variety of computer hardware and software combinations to maintain the database files. Although each database system can be searched individually, it is not possible to access the databases simultaneously. If users need to retrieve information on a specific topic from several of these databases, they must know the location of each database file and the routines required to access each database.

Each database operates independently, and between them they use a variety of hardware, (i.e., computer equipment), software (i.e., instructions by which the computer performs its tasks), and access techniques. Lacking a common mechanism that would allow "talk" between the various systems, a user must arrange for access with each agency or vendor, learn the database structure of each file, become familiar with the query language needed to access each database, and run different searches on each to retrieve information on one technical subject. For example, the techniques used to access and search DTIC's Defense Research, Development, Test, and Evaluation Online System cannot be used with the NSF's International Science and Technology Division database.

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## Combining Classified and Unclassified Information

Classification of sensitive data is required to protect national security interests. Several of the databases we identified as monitoring foreign technology information contain classified as well as unclassified data. Databases that combine classified and unclassified data present special

access problems. The presence of classified information in a database requires that user access be limited, even when the bulk of the information in the database could be made available to the public. For example, the Defense Intelligence Agency's Project Socrates' entire database is classified, although much of the information in the system is not classified and could be made available to wider groups of users.

When databases contain both classified and unclassified information, access is limited to people with appropriate security clearances. While it may be possible to separate the classified and unclassified information and so allow broader access to the unclassified portion, there is no general solution to the multilevel security problem and no current system that will guarantee the separation of classified and unclassified information. Multiple level security, which involves segregating classified from unclassified data and controlling access, is the subject of ongoing research. Combinations of physical, administrative, and technical approaches may provide opportunities for greater access to unclassified information.

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## Proprietary Information

Proprietary designations also limit access. Proprietary data are materials the private entity that provides the data considers business sensitive. We identified two problems in attempting to access information that carries a proprietary label.

One problem is that the mere presence of proprietary information in a database can limit access to information that is nonproprietary, thereby restricting its availability to a wider range of users. DOD's Information Analysis Centers are examples of databases that cannot be freely accessed because they contain some proprietary information. Each Center operates much the same way but specializes in a different subject. Each Center collects, analyzes, summarizes, and stores available information on highly specialized technical subjects. The collections are computerized to facilitate access, but include proprietary information, which limits access.

A second related problem, according to a DTIC official, is that information in databases is not always clearly marked as to what is proprietary. As a result, delays of up to 2 weeks can occur when users request information because of the need to clarify its status. For example, a requester could wait 2 weeks only to learn that the requested information was not proprietary. Conversely, some databases are not labelled as restricted, but requests for certain data are rejected because those data are labeled

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"U.S. Government Use Only." Such labelling occurs because the foreign data were either proprietary or copyrighted. As a result, requests for such information are burdensome and time consuming. In these instances, the requester normally does not follow up because of the paperwork involved and the time it takes to obtain the information.

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### Foreign Copyright Laws

Copyright laws also present access problems to users. A 1988 Department of Commerce report on federal efforts to obtain Japanese scientific and technical information noted that all material published in Japan, including government publications, is considered copyrighted regardless of whether it contains a copyrighted statement. Permission to reproduce this material is obtainable only after a lengthy approval process involving multiple layers of authority. NTIS has been able to alleviate this difficulty largely by negotiating blanket copyright releases with about 40 organizations with which it has acquisition agreements. However, copyright issues are still a barrier when NTIS wishes to obtain published material from a Japanese entity not covered under an acquisition agreement. According to NTIS' Deputy Director, copyright laws also limit NTIS' access to information in countries other than Japan.

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### Foreign Language Translation

According to the head of the DTIC's Information Systems and Standards Division, the translation of foreign documents is a major barrier to the exchange of technological information. He specifically cited the cost of translating documents and the lack of a sufficient number of people with both the technical and language skills required to do such work. Also, with respect to Japan, according to the previously mentioned Commerce report there are few federal agencies with staff who are proficient in translating Japanese technical literature. As a result, translators are so overwhelmed that much information does not get translated promptly.

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### Past and Current Efforts to Improve Access to Available Information

The federal government has made prior efforts to collect and disseminate foreign technical information; it presently has efforts underway, including a pilot project to do so. Those prior efforts did not produce a comprehensive system for collecting and disseminating this information, however, because support declined. The current efforts have somewhat improved access to information but are limited in scope or in the early stages of development.

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## Past Efforts

Efforts to coordinate technical information can be traced back to the 1960s. In 1962, responding to a growing concern over management problems and diffusion of information created by the rapid growth of scientific and technical activities, the Federal Council on Science and Technology Policy established the Committee on Science and Technical Information (COSATI). COSATI's functions were to (1) coordinate agency scientific and technical information services, (2) examine interrelationships between existing information services, both in and outside the government, and identify gaps or unnecessary overlaps, and (3) develop governmentwide standards and comparability among systems. COSATI members represented 12 of the largest scientific and technical information producer and user agencies of the government. COSATI encouraged voluntary coordination of U.S. scientific and technical activities abroad and collection of foreign technical information. According to a former COSATI Chairman, sharing of foreign technology information among participating federal agencies was encouraged but not required and distribution was not monitored. The former Chairman stated that information was presumed to be shared.

According to the former COSATI Chairman, in 1972, the White House Office of Science and Technology Policy's (OSTP) Director, acting on suggestions made in an NSF advisory report, transferred the leadership of COSATI to NSF as a management improvement. The former Chairman also said that COSATI's effectiveness as a coordinator of federal collection efforts had been restricted because of the lack of support by NSF. Because so much time has elapsed since this transfer occurred, we were unable to review the matter with knowledgeable NSF officials.

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## Current Efforts

We identified three efforts underway to improve access to foreign technical information collected by the government. They are Project STRIDE (Scientific and Technical Reporting Information Dissemination Enhancement), the Office of Japanese Technical Literature, and an Office of Naval Research program called Assessment System for European Technology and Science (ASSETS).

### Project STRIDE

Project STRIDE, similar to COSATI but more limited in scope, has its origins in the President's Executive Order of April 1987. In 1986, OSTP's Federal Coordinating Council's Committee on International Science, Engineering, and Technology established a Working Group on International Education, Infrastructure, and Facilities, which began exploring the adequacy and accessibility of information on foreign science and technology. The Working Group's exploration of the foreign science and technology

information problem led to the President's issuing Executive Order 12591, dated April 10, 1987. This order directed NSF and the Departments of State and Commerce to develop a central mechanism to promptly and efficiently disseminate to users in federal laboratories, academic institutions, and the private sector, on a fee-for-service basis, scientific and technological information developed abroad.

In response to this Executive Order, the three agencies initiated a jointly developed, 6-month pilot study for an unclassified information service known as Project STRIDE. Each of the three agencies performs different functions. The State Department uses its science officers at major foreign posts (including those in Western Europe and in Tokyo) to collect and report information through the U.S. government telegraphic network to a wide audience of end-users in the government. Commerce's NTIS publishes this information in its Foreign Technology Abstract Newsletter. NSF extracts information from the incoming STRIDE telegrams and introduces this information into its internal database network. NSF also includes this information in its periodical entitled International S&T Insight.

In 1988, Project STRIDE was evaluated by a private consulting firm. The consultant found problems in two areas: the supply of and the demand for STRIDE information. The consultant had been advised that there had been an assumption that STRIDE generated a large information flow that only needed dispersion to a "guaranteed" readership in the research and development community. In actuality, the consultant found that the information flow from STRIDE was limited, as was the interest among the evaluator and user group. The consultant concluded that attempts to generate a larger flow could be made, but would require a substantial commitment of resources. The consultant made a series of recommendations on how to improve STRIDE. The three agencies began to take corrective action, however, we were advised by the STRIDE consultant that the Department of State had discontinued its corrective actions.

Office of Japanese Technical  
Literature

Another current effort involves the Department of Commerce's Office of Japanese Technical Literature (OJTL). OJTL deals with technical activities and developments in Japan. It acquires and translates selected Japanese technical reports and documents and coordinates with other federal agencies and Departments to identify significant gaps and avoid duplication of effort in acquiring, translating, indexing, and disseminating Japanese technical information. OJTL's program responsibilities also include monitoring Japanese technical developments and consulting with U.S.

businesses, professional societies, and libraries on their need for Japanese scientific information.

According to Commerce's Deputy Assistant Secretary responsible for OJTL, the program has limited resources available to accomplish its mission. To compensate for this situation, it emphasizes the use of mailings to a network of persons and organizations OJTL believes would benefit from its work. OJTL also acts to promote dialogue. For example, the agency periodically holds conferences, inviting individuals and organizations that could benefit from information on Japanese technical literature. It conducts extensive meetings with other federal agencies and private firms. The program manager believes these organizations share that information with others, thus multiplying the distribution's effect.

To fulfill its responsibility for avoiding gaps in coverage and for preventing duplication, Commerce's Assistant Secretary for Technology Policy told us that the agency staff conducts interagency meetings and maintains informal contacts. Also, OJTL consults with agencies, businesses, and professional societies before selecting which technologies to monitor.

## ASSETS

The Office of Naval Research's ASSETS program is another effort to create a focal point for ready access to foreign technical information. ASSETS is an unclassified, free, text-based system available to all U.S. government agencies in Europe. It provides a rapid search and review of information concerning European science. ASSETS includes abstracts and articles together with details of authorship and local points of contact for the technology reported. The prohibitive telecommunications costs have limited system use.

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## Opportunities Exist to Improve Access to Foreign Technical Information

Technological improvements to computers for retrieving data and the establishment of a database of experts are two opportunities to improve access to foreign technical information. Other possibilities, such as the expansion of STRIDE, would require additional resources. Assessing the costs and benefits of such a funding increase was beyond the scope of our work.

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## Technological Improvements

Technological advances in accessing and retrieving computerized information may provide an answer to the problem of accessing foreign technical information available in different agency databases. These advances can make data retrieval faster and easier. At least one agency,

DTIC, is already trying to implement one of these techniques. DTIC, in an effort to gain greater access to available information, is experimenting with a data retrieval concept known as "gateways." The gateways concept is an attempt to electronically connect information systems with differing database structures, hardware, and software. At present, the concept is at an early stage of development and there is no general solution for linking different databases.

Gateways may be categorized as either "information" or "knowledge" types. The basic purpose of an information gateway is to help database system users understand their information needs. The information gateway retrieves and brings data to users. A knowledge gateway, on the other hand, goes beyond retrieving and offers users optional information processing that allows users to manipulate the data as necessary. If this is successful, information from international sources will be available to the DTIC's database users.

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## **Database of Experts**

As indicated earlier, many researchers and scientists collect information on their own initiative in their field of study. They strive to keep abreast of the latest developments and are frequently at the cutting edge of the technology under study. They frequently keep in touch with other leaders, including foreign scientists, and, on an informal basis, share knowledge. A database listing of experts and the disciplines they study could be developed. If the experts agree or are willing to participate, the database could indicate the person's name, address, telephone, number, fields of expertise, and other pertinent information.

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## **Conclusions**

The federal government collects an extensive amount of information on foreign technology; however, more of it could be made available to other agencies and the public. To be useful, this information must be accessible to the people who would benefit from it. However, there are a number of obstacles to obtaining the information, which impede its dissemination.

A 1960s effort to improve the coordination of foreign technical information ceased by 1972. Currently, efforts are underway to improve access to information, but they are modest in scope and limited in resources.

There are, however, some possibilities for improving access. One is a technological advance called gateways, which makes data retrieval faster and easier. Another is the possibility of separating restricted and

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**Chapter 3**  
**Improved Access to the Information That**  
**Federal Agencies Collect Is Needed**

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unrestricted information, such as classified from unclassified, and proprietary data from public information. These solutions may increase access to the foreign technology information the government presently collects.

Since there are many sources of foreign technical information of potential value to a large number of users, and since there have been past and are now current efforts to improve access to these sources, senior OSTP and NTIS officials believe this may be an appropriate time for the federal government to restudy the issue of collecting, collating, processing, and disseminating foreign technical information to a wider audience. We agree that there is a need for improved management and dissemination of such information, but are making no recommendations at this time pending the results of ongoing efforts and research to improve access to the information the government collects.

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# Description of Federal Agency Monitoring Activity

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Six federal agencies have major monitoring efforts. This appendix contains a description of their foreign technology monitoring activity.

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## Department of Commerce

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### National Technical Information Service

The National Technical Information Service collects and disseminates foreign scientific technical information regarding new research and developments obtained through agreements with hundreds of organizations. Monitoring is global and covers a wide variety of technologies. NTIS products are for sale to the public and are purchased by private industry, academic institutions, and individual researchers. The information is used as a source for new ideas and to keep professionals posted on the latest research in their fields.

NTIS' Office of International Affairs monitors developments in machine-aided translation, with special emphasis on Japanese-to-English language conversion. Machine-aided translation materials are also used within NTIS to expand its current service efforts, and they are expected to eventually improve general access to Japanese technical information. Translations are shared with other government agencies and made available to the general public on a cost recovery basis.

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### Bureau of Export Administration

The Bureau of Export Administration's Office of Foreign Availability monitors foreign technology to identify domestic export controls that are no longer effective because comparable technologies are available in foreign countries. Monitoring is global, depending on the industry and technology of interest, and covers all technologies. It uses resulting information in reviewing certain export license applications.

The Bureau's Office of Industrial Resource Administration monitors foreign technology to assess the impact of

- imports on national security,
- foreign investments on defense-related industries,
- DOD agreements on the U.S. industrial base, and
- foreign weapon development on defense preparedness.

It makes results of some of its efforts publicly available in a report to the President from the Secretary of Commerce. Other efforts result in internal and interagency memoranda making recommendations. The information is used to develop, implement, and promote a strong and technologically superior defense industrial base.

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## International Trade Administration

The International Trade Administration has five offices that play an active role in monitoring foreign technology.

The Office of Telecommunications monitors foreign technology to facilitate the export of U.S. telecommunications equipment and services. Global monitoring focuses on telecommunication technology in areas such as fibre optics, digital switching, and cellular phones. The results of these efforts are generally published in the U.S. Industrial Outlook. The Office makes individual studies available free of charge to other government agencies and to the public on a fee basis. The information included is used in domestic and trade policy formulation and promotion.

The Office of Aerospace monitors foreign technology to help reduce trade barriers and increase export opportunities for the U.S. aerospace industry. Monitoring focuses on the European Community, Brazil, Canada, Japan, and Southeast Asia. The technologies monitored relate to advanced aerospace technology. The information is published in the U.S. Industrial Outlook. Unclassified products are available to the public. Classified and restricted products are available to qualified U.S. government agencies. The information may be used to measure trade performance and help gauge U.S. industrial competitiveness.

The Office of General Industrial Machinery monitors foreign technology to analyze markets and promote foreign trade efforts undertaken by the U.S. metalworking industry. Monitoring efforts focus upon the European Community, the Soviet Union, Japan, Taiwan, Korea, and Brazil. The technologies tracked include computer controlled machine tools, metal cutting tools, welding and robotics. The results of these efforts are included in the U.S. Industrial Outlook. Assessments are available to the public from the U.S. Government Printing Office. The information is used to support trade development and government activities, including Voluntary Restraint Agreements and the President's Domestic Action Plan.

The Office of Computers and Business Equipment monitors foreign technology to support trade analyses and promotion efforts undertaken by

the U.S. computer and business equipment industry. While recent monitoring efforts have focused upon Japan, Korea, and Brazil, monitoring is global, and technologies include computer hardware and software, focusing in the last 2 years on supercomputer and personal computer technology. Competitive assessments and market studies have been available to the public from the U.S. Government Printing Office and NTIS for a fee. Products are available to other government agencies free of charge.

The Office of Microelectronics and Instrumentation monitors foreign technology to support increased exports of electronic devices and instruments. Global monitoring efforts track such technologies as microelectronics, semiconductors, medical equipment, and scientific instrumentation. The Office focuses on Japan, Korea, the People's Republic of China, the United Kingdom, West Germany, and France. The results of these efforts include competitive assessments and policy briefing papers. Competitive assessments are available to the public for a fee and are published in the U.S. Industrial Outlook. Most products are available to other government agencies free of charge. The information is used for policy formation and trade promotion.

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### The Japanese Technical Literature Program

The Japanese Technical Literature Program coordinates federal agency collection, translation, and dissemination efforts relating to Japanese technical information. The technologies tracked include advanced materials, microelectronics, manufacturing technology, biotechnology, medical equipment, and robotics. The program issues a quarterly news bulletin, the Annual Directory of Japanese Technical Resources, and annual summary reports on scientific and technical developments. The information is used to develop competitive assessments and new technical programs in the United States.

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## Department of Defense

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### The Defense Technical Information Center

The Defense Technical Information Center is the central collection and distribution point for scientific and technical information resulting from DOD's research and development efforts. The Center collects and disseminates foreign scientific technical information through international

exchange agreements, foreign contractors, and other DOD organizations. Global monitoring covers all scientific and technical literature. Products are available to Department of Defense organizations and their contractors, private industry, academic institutions, and other government agencies, sometimes for a fee. Unclassified reports are available to the public through NTIS. The information included can be used to support basic research, U.S. government policy formulation, and foreign scientific and technical information monitoring efforts by other U.S. government agencies.

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**Information Analysis Centers**

DOD's Information Analysis Centers acquire, analyze, and summarize foreign scientific and technical information in highly technical specialized subject areas. Subject areas of interest include software development, cold weather, nuclear science, and infrared analysis and technology. Bibliographies, abstracts, and the services of the Centers are available to authorized DOD units and to the public on a limited basis. The information can be used to support DOD basic and applied research, policy formulation, and acquisitions.

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**The Defense Intelligence Agency**

The Defense Intelligence Agency administers DOD's Socrates project. Socrates monitors foreign scientific and technical information to support DOD efforts to improve industrial competitiveness and provide planning information for U.S. military technological strategic purposes. Monitoring is global and focuses on specific technologies of strategic interest. The information collected is used to produce capability assessments of strategic technologies. Using these data, Project Socrates produces parameter reports to support export control decisions, research decisions, technology policy planning and international agreements. Products are classified and available to authorized government organizations.

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**Industrial and International Programs**

This program monitors foreign scientific and technical information to preserve export controls on technology that is military-critical and contributes to cooperative technology programs. Information from global monitoring is published in reports of the Institute for Defense Analyses. Access to these reports is essentially unlimited. Additionally, through the Institute for Defense Analyses, Industrial and International Programs provide foreign technology assessments in support of the Defense Critical Technologies Plan.

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The U.S. Army

The Army's European Research Office monitors foreign scientific and technical information to try to identify unique foreign technologies. These technologies are transferred to appropriate Army laboratories and research facilities. Monitoring focuses on Europe, the Middle East, India, and Africa. The technologies monitored include basic research in physics, chemistry, biology, mathematics, electronics, materials, engineering, and geosciences. The information acquired is included in Scientific Highlights, USARDSG-UK Research Activities Report, and the U.S. Army Research Office Annual Report. Distribution of these products is unrestricted. The data collected are used by the Army and other government agencies in the planning and execution of research and development programs.

Army laboratories monitor foreign scientific and technical information relevant to Army interests and responsibilities. Activities include the monitoring of meteorological data in Canada and Europe, the monitoring of robotics globally, and information on explosive devices focusing on France, West Germany, and the United Kingdom. The information is used to assess competitiveness, guide research and development efforts, and standardize techniques. Product distribution varies among the laboratories.

The Army's Foreign Science and Technology Center monitors foreign scientific and technical information relating to military material and hardware. Monitoring is global. Classified reports are available within the intelligence community. Unclassified reports are available to the public through DTIC and NTIS.

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The U.S. Navy

The Office of the Chief of Naval Operations monitors foreign technology by focusing on those technologies with potential naval application and those that can help identify areas for international research and development cooperation. Countries monitored include Australia, Brazil, Israel, Japan, South Korea, New Zealand, and Taiwan. The Office also develops bilateral and multilateral information exchange agreements and technology cooperation programs with foreign nations. Listings of the agreements and programs are available to the public.

The Office of Naval Research monitors foreign technology through offices in London and Tokyo. The London Office monitors science and technology developments in Europe and the Mediterranean Basin, and the Tokyo office monitors science and technology in Japan and Korea. The information obtained by the London Office is included in the ASSETS

database and contains abstracts, articles, and local points of contact of interest to the Office's European Office and the European scientific community.

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### The U.S. Air Force

The U.S. Air Force's Foreign Technology Division maintains the Central Information and Reference Control database. This office is the primary producer of global scientific and technical aerospace intelligence.

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### Department of Energy

Within the Department of Energy, research laboratories monitor foreign scientific and technical information relevant to their areas of research. Subjects of interest include nuclear weapons, high-energy lasers, composite materials, and reactor technology. Monitoring efforts cover countries with significant technical abilities in these areas, potential suppliers, and countries with potential interests in acquiring nuclear capability. A variety of products result from these efforts. Some information is maintained in databases. Information is generally classified and receives limited distribution. The information is used to support strategic planning, security related planning and decision-making, and tracking the flow of technology to sensitive nations.

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### Department of State

The State Department has science officers in 24 major posts abroad, including most Western European capitals and Tokyo, and at several international organizations, such as the Organization for Economic Cooperation and Development. The officers report on foreign science and technical developments to approximately 60 federal government units. These reports are provided to the National Technical Information Service for publication in the Foreign Technology Abstract Newsletter, which is available to the public for an annual subscription fee. The information is used by numerous federal agencies and researchers to monitor foreign technology developments of interest to them.

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### National Aeronautics and Space Administration

NASA maintains a comprehensive database system covering aeronautics, space, and supporting disciplines. The system began in 1962 and is maintained by NASA's Scientific and Technical Information Facility. Using this database, NASA produces semimonthly professional journals, including The Scientific and Technical Aerospace Reports and International Aerospace Abstracts. These publications comprise about two-thirds of the database and are commercially available in the United

States through NASA and the American Institute of Aeronautics and Astronautics.

As of 1988, approximately 37 percent of the database was from foreign sources, with about 14 percent from the Soviet Union and other Eastern Bloc countries. Japanese items make up about 5 percent of the database. NASA has informal, bilateral exchange arrangements with more than 20 Japanese organizations.

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## **National Science Foundation**

The National Science Foundation collects information about scientific developments and policy abroad. Subjects include astronomy, chemistry, materials, mathematics, physics, computing and information processing. Monitoring relates to scientific leadership in each subject. The information is used in the evaluation of grant proposals and reported in NSF publications.

The Division of International Programs coordinates and manages the NSF International Cooperative Scientific and Engineering Activities programs. The programs are intended to foster U.S. knowledge of science and engineering activities in foreign countries, to initiate and support international cooperative activities, to provide opportunities for scientific collaboration in developing countries, and to provide support to U.S. institutions for foreign research. Information and analysis activities are emphasized, including the monitoring of technical developments in approximately 50 countries and organizations.

The Division of Science Resource Studies collects current and detailed information on the scientific resources, activities, and capabilities of foreign countries. The information is included in Scientific Resources Highlights, published annually in the International Science and Technology Data Update, and maintained for public use of the Science Resources Studies' Electronic Bulletin Board. The data facilitate comparisons between U.S. scientific and engineering activities and those of Japan, Western Europe, the Soviet Union, and other nations. It is intended to provide timely, policy related information to research and development managers, science policymakers and other agencies within the federal government.

The Division of Electrical and Communications Systems manages the Japanese Technology Evaluation Project in collaboration with other federal agencies. The Project assesses Japanese research and development efforts in technologies such as advanced sensors and computer assisted

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**Appendix I  
Description of Federal Agency  
Monitoring Activity**

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design and manufacturing. Assessments are made available to the public through NTIS and are distributed directly to individual scientists listed with the Project. The studies are intended to provide an understanding of Japanese research and technology to federal decisionmakers and private industry.

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